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RED LIGHT FACILITATES THE SENSED PRESENCE ELICITED BY APPLICATION OF WEAK, BURST-FIRING MAGNETIC FIELDS OVER THE TEMPORAL LOBES

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To test the hypothesis that the wavelength (color) of ambient lightning should modulate experiences of a sensed presence when the right hemisphere was stimulated by weak, burst-firing magnetic fields, volunteers were exposed for 30 min to this condition or to a sham field while they sat (eyes opened) in either dim red, green, or white light. Subjects exposed to the magnetic field reported significantly more visual sensations along the left side in red light and along the right side in green light. The significant interaction between ambient color and the field treatment was due to the marked increase in experiences of dizziness, sensed presence, "ego-alien" thoughts, and detachment from the body and "being somewhere else" for subjects exposed to the magnetic field while sitting in red light. The concurrence of entoptic images experienced within the upper left peripheral visual field and the sensed presence supported the hypothesis that both are associated with the intrusion of right hemispheric processes into left hemispheric awareness.

Keywords magnetic fields, red light, right hemisphere, sensed presence

The sensed presence has been considered to be the experience of the right hemispheric equivalent of the left hemispheric sense of self (Persinger, 2003). Serious experimental study of the sensed presence, which is often ascribed

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with sentience and expanded spatial-temporal properties, is important because it may be the prototype for most reports of noncorporeal entities that include gods, deceased members of the person's family, and other ethereal forms (Booth, Koren, & Persinger, 2005). These phenomena are often relegated to "paranormal" or religious domains when they are more likely to be normal features of the human brain function.

In more than a dozen experiments involving hundreds of subjects, we (see St-Pierre & Persinger, 2006 for a review) have shown that the sensed presence can be reliably elicited within experimental settings by weak, physiologically patterned magnetic fields. For optimal effects the subject is blindfolded and sits within a comfortable chair within an acoustic chamber while weak complex patterns of magnetic fields are delivered for 30 min across their temporal lobes. A slight intensity gradient of the applied field favoring the right hemisphere facilitates the effect.

Perceived color, which is intrinsically electromagnetic frequency and energy (when multiplied by Planck's constant), may affect the detection of subtle phenomena within the environment. White light has been reported to interfere with the "manifestations" of paranormal phenomena, particularly those attributed to a sensed presence. White light is known to suppress the synthesis of intrinsic chemical structures, such as melatonin (Axelrod, 1971), the circadian variations of which have been associated with the incidence of "spontaneous" sensed presences, particularly apparitions (Persinger, 1993).

To test the potential interaction between ambient lighting and the application of presence-facilitating magnetic field, we exposed normal volunteers to either a sham field or a burst-firing field while they were exposed to either a low illumination of red, green, or white light. Dim red illumination, at least in rats, facilitates the detection of shifts in the static component of ambient magnetic fields (Olcese & Reuss, 1986).

Suppression of synthesis of melatonin occurs during paradoxical (dream) sleep (Goldstein & Pavel, 1981). Nights in which postmortem apparitions were reported were associated with enhanced geomagnetic activity (Persinger, 1988; Randall & Randall, 1991). Increased geomagnetic activity was also associated with lower levels of melatonin (Burch, Reif, & Yost, 1999). The suppression of the synthesis of nocturnal melatonin by applied magnetic fields (Lerchl, Reiter, Howes, Nanaka, & Stokkan, 1991), is facilitated in dim red light (Olcese, 1990). We reasoned that if the sensed presence is some form of intrusion of the right hemispheric equivalent (Kurup & Kurup, 2003) of the left hemispheric sense of self, transient electrical lability within the right hemisphere should encourage these experiences within dim ambient red light.

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A total of 15 men and 15 women, between 18 and 20 years of age, volunteered to participate in a relaxation study in exchange for 2 bonus points for their final grade in a first-year psychology class. The sample size was determined by the estimated effect size of the interaction between exposure to the applied magnetic field and ambient color. The subjects were told the study was involved with relaxation and hypnosis; the sensed presence was not discussed.

The procedure was similar to that reported by Persinger and Healey (2002) except the subjects were not blindfolded. Each subject sat within a comfortable armchair and wore the Koren helmet, with which four sets of solenoids were embedded, through which complex magnetic fields were delivered. The intensity along the left-right hemispheric plane was 2 uT higher over the right hemisphere compared to the left. A burst-firing magnetic field, composed of 239 points, with point durations equal to 3 msec, was delivered once every 4 sec for 30 min (about 380 presentations).

During the 30 min exposure the person was instructed to relax. Light was emitted from two 40-watt bulbs in two lamps that were placed on stands about 1 m to the side of where the person was sitting. Equal numbers of subjects were exposed to the white light or to the lamps with the same bulbs covered with either green or red cinematographic gels. Half the numbers of subjects in each of these conditions received either the burst-firing magnetic field or the sham field.

At the end of the 30 min session the subjects were administered the exit questionnaire (Persinger, 2003) that contained 20 items referencing the most common experiences (0 = no occurrence, 1 = at least one occurrence, 2 = several occurrences). The scores for the five variables that have loaded on the "presence" factor were totaled for each subject. The items included references to dizziness, a presence, feeling detached, "information" not coming from the experient's own mind, and feeling as if the person was somewhere else. Analyses of variance as a function of color, field, and sex were completed. All analyses involve SPSS software on a Vax 2000 computer.

There were no statistically significant differences in the scores for the presence factor as a function of the color of the light [$F(2,24) = 1.65$, $p > .05$] or magnetic field treatment [$F(1,24) = .02$, $p > .05$]. However there was a statistically significant interaction between ambient color and field [$F(2,24) = 17.94$, $p < .001$]. *Post hoc* analyses indicated that the significant interaction between field presentation and color was due to the decreased scores for the sensed presence in white light when the burst-firing magnetic field was present ($M = 1.8$, SD = 1.5) compared to sham field conditions ($M = 5.0$, SD = 3.5),

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while the scores for the cluster significantly increased when the field was presented during red light ($M = 6.6$, SD = 0.6) compared to when there was no field ($M = 1.4$, SD = 1.1). The scores for subjects exposed to the green light during no field ($M = 2.6$, SD = 2.1) or field ($M = 1.5$, SD = 1.0) conditions did not differ significantly from each other.

There were several statistically significant interactions between the presentations of the field and different colors for the experience of visual sensations (all dfs = 2,24) in the upper vision field [$F = 3.94$, $p < .05$), left peripheral visual field [$F = 6.46$, $p < .001$], and right visual field [$F = 5.93$, $p = .01$]. *Post hoc* analyses indicated that the interaction between field and ambient color for sensations in the upper visual field was due to the absence of these sensations in white light when the field was present compared to when the field was absent (67%). The interaction between field and color for the left peripheral visual field sensations was primarily due to their predominance when the light was red and the fields were present. These interactions for the right peripheral visual field sensations were reported exclusively (75%) for those subjects when the green light and magnetic field were present.

When the association between magnitude of the experience of a sensed presence and visual experiences within the upper right visual field was first covaried, the F values remained statistically significant for the interaction between the field and color for the upper visual and right visual fields [$F = 4.13, p < .05$; $F = 8.30, p < .01$, respectively] for subjects exposed to the green light only. However when the shared variance between the magnitude for the sensed presence and visual experiences attributed to the upper left visual field were first removed, the numbers of experiences as a function of exposure or no exposure to the magnetic field were no longer statistically significant [$F = 1.68, p > .05$]. However initial covariance for the association between upper left visual field experiences and the sensed presence did not change the significant magnetic field enhancement for the magnitude of sensed presence for the group exposed to the red light.

These results suggest that exposure to a dim red light while burst-firing magnetic fields were presented preferentially over the right temporal lobes of normal people increased experiences associated with the sensed presence. The visual sensations, which were lateralized to the upper left visual field, were primarily entoptic images (Lewis-Williams & Dowson, 1988). They were related to the same source of variance that caused the sensed presence because initial covariance for this score eliminated the significant difference in numbers of these images due to the magnetic field treatment. Consistent with previous observations (Booth et al., 2005; Kurup & Kurup, 2003) both experiences

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associated with the sensed presence and with visual sensations within the upper left peripheral visual fields may be related to preferential stimulation of structures within the right temporal lobe.

If the sensed presence is simply the awareness of the right hemispheric equivalent of the left hemispheric sense of self, then the energies of frequencies associated with dim red light should enhance the process that allows this "intrusion" into awareness. Exposure to ambient dim red light has been shown to increase the detectability of weak magnetic fields in rats (Olcese & Reuss, 1986). In fact, inversion of the horizontal component of an applied static magnetic field for 15 min or more inhibited the activity of hydroxindole-O-methyltransferase (the enzyme that synthesizes melatonin) in dim red light but not in the dark (Olcese, 1990). Transient decreases in melatonin levels could allow intrusion of "dream" or rapid eye movement (REM)-like states into awareness, particularly when the person was sitting in a quiet, dimly lit room. In fact, Birkeland (1982) showed that nadirs in melatonin levels for human subjects were significantly associated with REM but not with other stages of sleep.

Thirty minutes of exposure to red light in this study would be sufficient to allow the processes associated with nocturnal vision to be manifested. It may be relevant that rod vision may allow enhanced discernment or even novel detection of stimulus patterns within the environment to which the experient may be oblivious during white light conditions. Concurrent factors may include stimulation of the habenular complex, which may have multiple inputs into the pineal organ (Sandyk, Anninos, & Tsagas, 1991). Enhanced prolactin release due to inhibition of dopamine pathways by magnetic fields would be consistent with the less frequently known report of increased sexual desire (Kruger, Haake, Hartmann, Schedlowski, & Exton, 2002) or sexual arousal during application of the types of magnetic field patterns employed in the present study.

The results of this study are congruent with the observation that a red light background inhibited the magnocellular retinal-geniculate-cortical pathways and disrupted behavioral tasks that required high temporal resolution (Breitmeyer, May, & Heller, 1991). Such high-resolution tasks are associated with larger amplitude visual-evoked potentials within the left hemisphere (Mecacci & Spinelli, 1987). We suggest that this suppression of the left hemispheric magnocellular pathway allowed dominance of right hemispheric processing that resulted in more experiences of entoptic images and the sensed presence along the left (primarily) upper visual fields.

The right hemisphere is more strongly affected by the parvocellular pathway (Okubo & Nicholls, 2005). It is also more accurate for high-spatial

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and low-temporal resolution of stimuli. If the magnocellular and parvocellular pathways are the neural analogs of the transient and sustained channels for visual processing as hypothesized by Livingston and Hubel (1987), then suppression of the transient channels by the red light would allow the sustained changes from the applied magnetic fields to be maintained for longer durations and hence would facilitate the intercalation of information from the right to the left hemisphere.

On the other hand, the activity of the normally dominant left hemisphere was not suppressed within the green light (Okubo & Nicholls, 2005). As a result the application of the magnetic field within the green ambiance resulted in a greater proportion of the sensed presence and visual phenomena experienced along the right side of the body. In both instances the most likely loci for the "pattern recognition" described as a presence would involve the inferotemporal cortices (Goodale & Miller, 1992), a concept compatible with our hypothesis.

We cannot exclude the possibility of a significant contribution from the vectorial configuration of the experimental chamber in which the subjects were exposed. Within the chamber the strength of the resultant geomagnetic (static) field is reduced from about 45,000 nT to 20,000 nT and the ambient static electric field is about 10 V/m. Because motion or velocity (m/s) is the quotient for the electric field (V/m) divided by the magnetic field (Tesla), the solution for these values would be about 5×10^5 m/s. This value is remarkably similar to the predicted velocity of electrons according to Cosic's (1994) calculations that would allow resonant recognition of macromolecules at a distance.

It may be relevant that the difference in energy between a photon perceived as red (660 nm) and an energy (from the product of its frequency and Planck's constant) of 3.01×10^{-19} J and a photon perceived as green (497 nm) and an energy of 4.00×10^{-19} J is about 1×10^{-19} J or the energy from applying 0.63 V over a unit electric charge of 1.6×10^{-19} A-s. This potential difference is within the order of magnitude of the discrepancy expected for the steady potential across the corpus callosum between the axon-richer right hemisphere compared to the left hemisphere.

From this perspective the "intrusion" of the right hemispheric sense of self into left hemispheric awareness might be more accurately described as the macroscopic analogue of a quantum "condensate." Like the synchronization of clock pendulums on a wall observed by Huygens' four hundred years ago or the synchronization of random neuronal firing (Hoppensteadt, 1997) similar process would allow homogeneity of neuronal patterns over large volumes within the cerebrum. The slight right-side enhancement of the strength of our applied magnetic fields could allow the essential properties of the field with

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the right hemisphere to briefly intercalate with left hemispheric awareness at which time the feeling of "another sentience" or "parasitic consciousness," to employ Hughling Jackson's classical descriptor, would be experienced.

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